

**ABSTRACT OF THE DISCLOSURE**

Methods of preparing improved semiconductor substrates having gate oxide layers formed thereon, and use of such substrates in fabricating improved semiconductor devices, are disclosed. The methods include a first step of performing a cleaning process for removing a natural oxide layer formed on a semiconductor substrate and also for removing an oxide layer generated by the removal of the natural oxide layer; a second step of executing a hydrogen annealing process to form a hydrogen passivation layer and for further reducing a surface roughness of the semiconductor substrate completed in the cleaning process; a third step of forming a gate oxide layer thereon; a fourth step of performing a nitridation process on the gate oxide layer to prevent the semiconductor substrate from a permeation of ions during a subsequent gate electrode formation step; and, a fifth step of performing a subsequent thermal process to stabilize a surface of the gate oxide layer, thereby improving a defect rate of the device caused in forming the gate oxide layer.

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